REMARKS

Applicants respectfully request reconsideration of the above-identified application in view of the proposed amendment above and the remarks below.

Claims 10 and 71-75 are canceled herein. Claims 1, 11, 17 and 58 are amended herein. No new claims are added herein. Therefore, claims 1-8, 11-17, 19-20 and 58-61 are pending and under active consideration.

Claims 58-61 and 74-75 stand rejected under 35 U.S.C. 102(b) "as being anticipated by Marinaccio et al (US 4,915,839)." In support of the rejection, the Patent Office states the following:

> Claim 58: Marinaccio teaches a microporous membrane comprising a microporous support (abstract) and a hydrophilic coating directly on said microporous support made by applying and cross-linking a polyfunctional epoxy compound with three epoxy groups (see col 14 lines 34-49). Re self-polymerization, it is inherent even if the reference explicitly states so, since the reference uses the same reagents as claimed (see also applicants Specification page 12, last para). Under principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. In re King, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986).
>
> Claim 59: microporous membrane is a polyamide - see example 1.
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> Claim 60: microfiltration membrane - col 6 lines 54-56
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> Claim 61: microporous membrane is an ultrafiltration membrane - even though the reference focuses on microfiltration membrane in col 16 lines 36-57, the pore diameter for the microfiltration membrane overlaps with the pore diameter of the ultrafiltration membrane defined by the applicant in specification

page 8 (upper limit of 500 nm = 0.5 microns; ref has microfiltration as from 0.05 microns or larger).

Claims 74 and 75: Marinaccio uses polyepoxides - there for has more than 4 epoxy groups and has polyglycerol polyglycidyl ether (col 14- formula).

Insofar as the subject rejection pertains to claims 74-75, the rejection is moot in view of Applicants' cancellation herein of these claims. Insofar as the subjection rejection pertains to claims 58-61, Applicants respectfully traverse the rejection.

Claim 58, from which claims 59-61 depend, has been amended herein so as to be drawn to particular polyfunctional epoxy compounds; as such, claim 58 now recites "[a] microporous membrane comprising:

(a) a microporous support; and

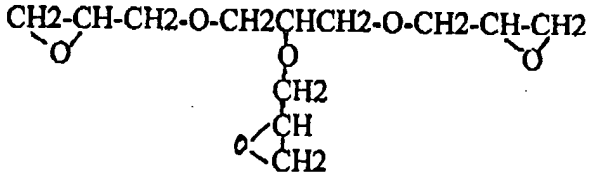
(b) a hydrophilic coating directly on said microporous support, said hydrophilic coating being made by (i) applying to the microporous support a quantity of a polyfunctional epoxy compound, said polyfunctional epoxy compound selected from the group consisting of diglycerol triglycidyl ether; pentaerythritol triglycidyl ether; sorbitol triglycidyl ether; glycerol propoxylate triglycidyl ether; trimethylolpropane triglycidyl ether; 1,1,1-tris(hydroxymethyl)ethane triglycidyl ether; 1,1,1-tris(hydroxyphenyl)ethane triglycidyl ether; tris(hydroxymethyl)nitromethane triglycidyl ether; phloroglucinol triglycidyl ether; a reaction product of epichlorohydrin and 1,3,5,-tris(2-hydroxyethyl)cyanuric acid; a reaction product of epichlorohydrin and tris(hydroxymethyl)amino methane; sorbitol tetraglycidyl ether; pentaerythritol tetraglycidyl ether; polyglycerol polyglycidyl ether; polyglycerol tetraglycidyl ether; a reaction product of polyvinyl alcohol and epichlorohydrin; a reaction product of polyvinyl phenol and epichlorohydrin; a reaction product of polyacrylamide

and epichlorohydrin; a reaction product of epichlorohydrin and cellulose; and a reaction product of epichlorohydrin and a cellulose derivative, and (ii) then, cross-linking the polyfunctional epoxy compound in such a manner as to yield a water-insoluble polymer, wherein said polyfunctional epoxy compound is cross-linked solely through self-polymerization."

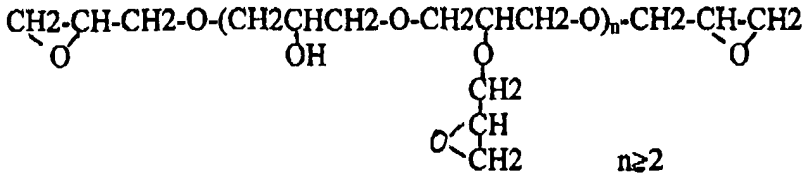
Claim 58 is neither anticipated by nor rendered obvious over Marinaccio et al. for at least the reason that Marinaccio et al. does not teach or suggest, among other things, a hydrophilic coating applied directly to a microporous support **wherein the hydrophilic coating is made solely through the self-polymerization of a polyfunctional epoxy compound selected from the group of polyfunctional epoxy compounds recited in claim 1.**

As best understood, the Patent Office is apparently contending that Marinaccio et al. anticipates claim 58 because Marinaccio et al. allegedly discloses, at col. 14, lines 34-49, the claimed "polyglycerol polyglycidyl ether." For at least the reasons given below, Applicants respectfully disagree and respectfully submit that polyglycerol polyglycidyl ether and the other polyfunctional epoxy compounds of claim 58 differ markedly from the aforementioned Marinaccio compound.

The Marinaccio compound disclosed at col. 14, lines 34-49, and referred to by the Patent Office in the outstanding Office Action as "polyglycerol polyglycidyl ether" has the following chemical formula:



By contrast, polyglycerol polyglycidyl ether actually has the following chemical formula:



In view of the above, Applicants respectfully submit that the Marinaccio compound shown at col. 14, lines 34-49, is not the claimed polyglycerol polyglycidyl ether, but rather, is glycerol triglycidyl ether. Polyglycerol polyglycidyl ether is not structurally similar to glycerol triglycidyl ether and, in fact, differs considerably from glycerol triglycidyl ether. For example, polyglycerol polyglycidyl ether includes, among other things, **at least four epoxy groups**[1] and **at least two hydroxyl groups** whereas glycerol triglycidyl ether includes **three epoxy groups** and **zero hydroxyl groups**. Due in large part to its two or more hydroxyl groups, polyglycerol polyglycidyl ether is more soluble in water than is the case for glycerol triglycidyl ether and leads to a more hydrophilic coating upon polymerization than is the case for glycerol triglycidyl ether. In addition, owing in part to its two or more hydroxyl groups, polyglycerol polyglycidyl ether is able to undergo self-polymerization more readily than is the case for glycerol triglycidyl ether.

Claim 58 is further distinguishable over Marinaccio et al. for the reason that claim 58 now requires that the polyfunctional epoxy compound be cross-linked solely through self-polymerization. By contrast, the above-discussed Marinaccio glycerol triglycidyl ether does not cross-link **solely** through self-polymerization as the subject Marinaccio compound is only disclosed as being used to

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[1] Applicants note that Marinaccio et al., at col. 13, lines 23-28, specifically teaches away from polyfunctional epoxy compounds having four or more epoxy groups. ("Similarly, it is theorized that a polyepoxide offering greater than three epoxy groups offers no benefit and in fact may limit the coupling reactions of the polyepoxide by steric hindrance.")

cross-link other compounds. (See, for example, col. 14, lines 34-35, of Marinaccio where the subject glycerol triglycidyl ether is said to be used as "the polyepoxide cross-linking agent.") It would make no sense for the subject compound to be "the polyepoxide cross-linking agent" if it were cross-linking exclusively by self-polymerization. In short, there is no teaching or suggestion that the subject Marinaccio compound cross-links **solely** through self-polymerization.

Accordingly, for at least the above reasons, the subject rejection should be withdrawn.

Claims 1-8, 10-17, 19-20 and 71-73 stand rejected under 35 U.S.C. 103(a) "as being unpatentable over Mickols (853) in view of Marinaccio et al. (US 4,915,839)." In support of the rejection, the Patent Office states the following:

> Claim 1: Mickols teaches a reverse osmosis membrane comprising a microporous support, a polyamide layer on the microporous support (col 3 lines 10-20) and a hydrophilic coating of a cross-linked epoxy compound (col 4 lines 25-46) as in claim 1. However, Mickols teaches a di-epoxide, not an epoxide having at least three epoxy groups. Marinaccio teaches three epoxy groups in cross-linking a membrane (see structures in col 12). It would be obvious to one of ordinary skill in the art at the time of invention to use the teaching of Marinaccio in the teaching of Mickols for having cationic, anionic or zwitterion membranes because it makes the membrane sanitizable or sterilizable, and capable of capturing anionic, cationic and other particles smaller than the effective pore size of the membrane (Marinaccio col 5 line 55 - col 6 line 11).
>
> Also the structure of the hydrophilic coating taught by Mickols would be similar or obvious equivalent (structurally and functionally) to what is claimed, even if the Mickols ref does not teach self-polymerization for the coating or using cross-linking coatings that is different from the polyamide layer, unless the applicants can prove otherwise, with evidence. Self-polymerization or cross-linking are process steps. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the

same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Cross-linking with the help of a cross-linking compound - see Marinaccio col 9 line 61 - col 14 line 10); cross-linked through self polymerization: inherent from Mickols in view of Marinaccio; similar reagents as used by the applicant should produce similar products. The express, implicit, and inherent disclosures of a prior art reference may be relied upon in the rejection of claims under 35 U.S.C. 102 or 103. "The inherent teaching of a prior art reference, a question of fact, arises both in the context of anticipation and obviousness." In re Napier, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995)(affirmed a 35 U.S.C. 103 rejection based in part on inherent disclosure in one of the references). See also In re Grasselli, 713 F.2d 731, 739, 218 USPQ 769, 775 (Fed. Cir. 1983).

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Claim 10 and 73: one or more of the compounds listed are taught by Marinaccio (col 14 lines 1-68) - for example, polyglycerol polyglycidyl ether. Even if not, the number of compounds recited in the claims would make them obvious equivalents. These claims and Applicants' specification (pages 15-21) list a huge number of classes of compounds that would provide the hydrophilic coating, from which it seems that the compounds (species) are obvious equivalents [A prima facie case of obviousness may be made when chemical compounds have very close structural similarities and similar utilities. "An obviousness rejection based on similarity in chemical structure and function entails the motivation of one skilled in the art to make a claimed compound, in the expectation that compounds similar in structure will have similar properties." In re Payne, 606 F.2d 303, 313, 203 USPQ 245, 254 (CCPA 1979). See In re Papesch, 315 F.2d 381, 137 USPQ 43 (CCPA 1963)(discussed in more detail below) and In re Dillon, 919 F.2d. 688, 16 USPQ2d 1897 (Fed. Cir. 1991)(discussed below and in MPEP § 2144) for an extensive review of the case law pertaining to obviousness based on close structural similarity of chemical compounds. See also MPEP § 2144.08, paragraph II.A.4.(c).].

Self-polymerization is inherent with the triglycidyl ether in Marinaccio - In re King. Cross-linking with a cross-linking compound is taught by Marinaccio.

Claim 11: cross-linked through self-polymerization: inherent from Mickols in view of Marinaccio; similar reagents as used by the applicant should produce similar products. The express, implicit, and inherent disclosures of a prior art reference may be relied upon in the rejection of claims under 35 U.S.C. 102 or 103. "The inherent teaching of a prior art reference, a question of fact, arises both in the context of anticipation and obviousness." In re Napier, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995)(affirmed a 35 U.S.C. 103 rejection based in part on inherent disclosure in one of the references). See also In re Grasselli, 713 F.2d 731, 739, 218 USPQ 769, 775 (Fed. Cir. 1983).

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Claims 19 and 20: Marinaccio may not be listing the exact carboxylic or sulfonic acids listed as in these claims, but teaches polyfunctional carboxylic or sulfonic acids in col 13 line 55 - col 14 line 11, which would afford anionic (negative charged) membrane, or compounds having zwitter ions in col 14 lines 55-68, as recited in the specification page 19, 4th paragraph and page 20, 1st para, and therefore, equivalent. In this case, the prior art element: (A) performs the identical function specified in the claim in substantially the same way, and produces substantially the same results as the corresponding element disclosed in the specification. Kemco Sales, Inc. v. Control Papers Co., 208 F.3d 1352, 54 USPQ2d 1308 (Fed. Cir. 2000). (B) is not excluded by any explicit definition provided in the specification for an equivalent. A person of ordinary skill in the art would have recongized the interchangeability of the element shown in the prior art for the corresponding element disclosed in the specification. (Citations omitted.) Also, a prima facie case of obviousness may be made when chemical compounds have very close structural similarities and similar utilities. "An obviousness rejection based on similarity in chemical structure and function entails the motivation of one skilled in the art to make a claimed compound, in the expectation that compounds similar in structure will have similar properties." In re Payne, 606 F.2d 303, 313, 203 USPQ 245, 254 (CCPA 1979). See In re Papesch, 315 F.2d 381, 137 USPQ 43 (CCPA 1963) and In re Dillon, 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1991) (discussed in MPEP § 2144) for an extensive review of the case law pertaining

> to obviousness based on close structural similarity of chemical compounds. See also MPEP § 2144.08, paragraph II.A.4.(c). "[I]n considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." (Citations omitted.)
>
> In all the above claims, as in claim 1, it would be obvious to one of ordinary skill in the art at the time of invention to use the teaching of Marinaccio in the teaching of Mickols for having cationic, anionic or zwitterion membranes because it makes the membrane sanitizable or sterilizable, and capable of capturing anionic, cationic and other particles smaller than the effective pore size of the membrane (Marinaccio col 5 line 55 - col 6 line 11).

Insofar as the subject rejection pertains to claims 10 and 71-73, the rejection is moot in view of Applicants' cancellation herein of these claims. Insofar as the subject rejection pertains to claims 1-8, 11-17 and 19-20, Applicants respectfully traverse the subject rejection.

Claim 1, from which claims 2-8, 11-17 and 19-20 depend, has been amended herein so as to be drawn to particular polyfunctional epoxy compounds; as such, claim 1 now recites "[a] composite polyamide reverse osmosis membrane comprising:

(a) a microporous support;

(b) a polyamide layer on said microporous support; and

(c) a hydrophilic coating on said polyamide layer, said hydrophilic coating being made by (i) applying to the polyamide layer a quantity of a polyfunctional epoxy compound, said polyfunctional epoxy compound selected from the group consisting of diglycerol triglycidyl ether; pentaerythritol triglycidyl ether; sorbitol triglycidyl ether; glycerol propoxylate triglycidyl ether; trimethylolpropane triglycidyl ether; 1,1,1-tris(hydroxymethyl)ethane triglycidyl ether; 1,1,1-tris(hydroxyphenyl)ethane triglycidyl ether; tris(hydroxymethyl)nitromethane triglycidyl ether;

phloroglucinol triglycidyl ether; a reaction product of epichlorohydrin and 1,3,5,-tris(2-hydroxyethyl)cyanuric acid; a reaction product of epichlorohydrin and tris(hydroxymethyl)amino methane; sorbitol tetraglycidyl ether; pentaerythritol tetraglycidyl ether; polyglycerol tetraglycidyl ether; sorbitol pentaglycidyl ether; sorbitol hexaglycidyl ether; polyglycerol polyglycidyl ether, and (ii) then, cross-linking the polyfunctional epoxy compound in such a manner as to yield a water-insoluble polymer, wherein said polyfunctional epoxy compound is cross-linked through at least one of self-polymerization and the help of a cross-linking compound, said cross-linking compound differing from said polyamide layer."

As best understood, the Patent Office is apparently contending (i) that Mickols teaches the composite polyamide reverse osmosis membrane of claim 1, except for the claimed hydrophilic coating; (ii) that Marinaccio et al. discloses the claimed hydrophilic coating; and (iii) that it would have been obvious at the time of the invention to a person of ordinary skill in the art to have replaced the grafted Mickols di-epoxide compounds with the Marinaccio coating. For at least the reasons provided below, Applicants respectfully disagree with the Patent Office's line of reasoning.

First, Marinaccio et al. does not teach or suggest the claimed hydrophilic coating. As noted above, claim 1 has been amended herein to specify that the claimed hydrophilic coating is obtained by cross-linking a polyfunctional epoxy compound selected from a particular group of polyfunctional epoxy compounds. **None of the specific polyfunctional epoxy compounds recited in claim 1 are taught or suggested by Marinaccio et al.** As explained above, contrary to the Patent Office's assertion, Marinaccio et al. does not disclose polyglycerol polyglycidyl ether, but rather, discloses glycerol triglycidyl ether. **Glycerol triglycidyl ether is not structurally similar to polyglycerol polyglycidyl ether nor is it structurally similar to any of the other compounds in claim 1**. To

the extent that the Patent Office appears to be suggesting that, by virtue of the number of polyfunctional epoxy compounds recited in claim 1, the recited class of compounds is somehow rendered obvious, Applicants respectfully disagree. The issue is not whether the claimed compounds are obvious over one another, but rather, whether the prior art suggests the claimed compounds. In the present case, none of the compounds of claim 1 are sufficiently structurally similar to glycerol triglycidyl ether or to any of the other compounds of Marinaccio et al. to support a prima facie case of obviousness.

Second, there would have been no motivation for a person of ordinary skill in the art to apply the Marinaccio coating to the Mickols composite polyamide reverse osmosis membrane. The reason offered by the Patent Office as motivation for making the proposed combination is that application of the Marinaccio coating to the Mickols membrane would make the Mickols membrane "sterilizable or sanitizable." However, whereas it may be desirable to make a microporous membrane like that of Marinaccio "sterilizable or sanitizable," there would have been no comparable reason to want to make a polyamide reverse osmosis membrane like that of Mickols "sterilizable or sanitizable" since sterilizing or sanitizing such a membrane would inevitably involve heating the membrane to a high temperature and such a heating of the membrane would negatively affect the flux of such a membrane.

Also, as noted in previous correspondence to the Patent Office, the Marinaccio coating is used primarily to improve the **filtering capacity** of the Marinaccio membrane. This is necessary because the Marinaccio membrane does not include a polyamide layer, but rather, only includes a microporous support having a relatively large pore size; consequently, because of the lack of a polyamide layer in Marinaccio, there is a great need to improve the filtering capacity of the

membrane if the membrane is to be used for the types of applications aspired to by Marinaccio et al.. Such a need, however, is absent in the case of Mickols, which already includes a polyamide layer. Consequently, in view of the fact that the Marinaccio coating is being used for a purpose that is already being served in large part by the Mickols polyamide layer, one of ordinary skill in the art would not have been motivated to apply the Marinaccio coating to the Mickols polyamide membrane.

Claim 11 is further distinguishable over the applied references for the reason that claim 11 requires that the polyfunctional epoxy compound be cross-linked **solely** through self-polymerization.

Claim 16 is further distinguishable over the applied references for the reason that claim 16 recites certain cross-linking compounds that are neither taught nor suggested by the references. The Patent Office is apparently contending that Marinaccio et al. teaches, at col. 14, lines 24-28, "cross linking agent selected from diols such as 1,3-propane diols." However, Applicants respectfully submit that the Patent Office is misreading the reference. Marinaccio et al. does not teach that diols, themselves, are to be used as cross-linking agents, but rather, teaches that diglycidyl ethers of aliphatic diols may be used as cross-linking agents.

Claim 17 is further distinguishable over the applied references because **none** of the hydrophilic coatings of claim 17 are **charged** whereas **all** of the hydrophilic coatings of Marinaccio et al. are either **positively-charged** or **negatively-charged**.

Claims 19 and 20 are further distinguishable over the applied references because all of the recited cross-linking compounds are acidic and zwitter ionic compounds having both acidic groups and hydroxyl or amino (primary or secondary) groups. These claimed cross-linking compounds react with the recited polyfunctional epoxy compounds through hydroxyl or amino (primary or secondary)

groups to form **stable ether or amine linkages**. By contrast, the cross-linking compounds of Marinaccio have either only acidic groups or acidic groups plus tertiary amino groups. The Marinaccio cross-linking compounds react with the Marinaccio compounds through acidic groups to form coatings with **ester linkages**. Such ester linkages are not hydrolytically stable.

Accordingly, for at least the above reasons, the foregoing rejection should be withdrawn.

In conclusion, it is respectfully submitted that the present application is now in condition for allowance. Prompt and favorable action is earnestly solicited.

If there are any fees due in connection with the filing of this paper that are not accounted for, the Examiner is authorized to charge the fees to our Deposit Account No. 11-1755. If a fee is

required for an extension of time under 37 C.F.R. 1.136 that is not accounted for already, such an extension of time is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

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Dated: December 14, 2004

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on December 14, 2004

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